WHAT IS CLAIMED IS:

1. A system for tracking the motion of an object relative to a moving reference frame, comprising:

a first inertial sensor mounted on the tracked object;

a second inertial sensor mounted on the moving reference frame;

a third inertial sensor mounted on the moving reference frame and spaced apart from the second inertial sensor; and

an element coupled to said first and second and third inertial sensors and configured to determine a position of the object relative to the moving reference frame based on the signals from the first and second and third inertial sensor.

2. The system of claim 1 in which the determination of the position of the object includes determination of at least one component of the angular acceleration of the moving reference frame.

3. The system of claim 2, in which the determination of angular acceleration is made by combining linear acceleration data from the second and third inertial sensors.

4. The system of claim 1, further comprising a non-inertial measuring subsystem for making independent measurements related to the position of the object relative to the moving reference frame, and using them for correcting any drift that may occur in the inertial orientation integration.

5. The system of claim 4, in which the non-inertial measuring subsystem is selected from the set of optical, acoustic, magnetic, RF, or electromagnetic technologies.

6. The system of claim 5, in which the non-inertial measuring system is optical and involves measurement of the location of one or more targets in the image planes of one or more sensors.

7. The system of claim 6, where the targets emit radiation within a defined bandwidth about a central wavelength selected in the infrared, visible or ultraviolet region of the electromagnetic spectrum.

8. The system of claim 7, where the central wavelength is substantially invisible to night vision equipment.

9. The system of claim 7, where the central wavelength is substantially invisible to the human eye.

10. The system of claim 6, in which at least one optical sensor is mounted on the tracked object.

11. The system of claim 10, further comprising at least one optical sensor mounted rigidly with respect to the moving reference frame.

12. The system of claim 6, in which the optical system comprises two sensors mounted rigidly with respect to the moving reference frame, and separated by at least 10 centimeters.

13. The system of claim 12, in which the second inertial sensor is physically packaged with one of the optical sensors, and the third inertial sensor is physically packaged with the other optical sensor.

14. A system for tracking the motion of an object relative to a moving reference frame comprising:

a first inertial sensor mounted on the tracked object;

a second inertial sensor mounted on the moving reference frame;

a third inertial sensor mounted on the moving reference frame and spaced apart from the second inertial sensor;

an element coupled to said first and second and third inertial sensors and configured to determine a position of the object relative to the moving reference frame based on the signals from the first and second and third inertial sensor; and

a drift corrector for correcting inertial drift in the determined orientation of the object with respect to the moving reference frame.

15. The system of claim 14, where the drift corrector includes a Kalman filter.

16. A system for tracking the motion of an object relative to a moving reference frame comprising:

a first inertial sensor mounted on the tracked object;

a second inertial sensor mounted on the moving reference frame;

means coupled to said first and second inertial sensors for determining an orientation of the object relative to the moving reference frame based on the signals from the first and second inertial sensors; and

a drift corrector for correcting inertial drift in the determined orientation of the object with respect to the moving reference frame, where the drift corrector includes a Kalman filter.

17. A method for tracking the motion of an object relative to a moving reference frame comprising:

mounting a first inertial sensor on the tracked object;

mounting a second inertial sensor on the moving reference frame;

determining an orientation of the object relative to the moving reference frame based on the signals from the first and second inertial sensors; and

correcting inertial drift in the determined orientation of the object with respect to the moving reference frame, using a Kalman filter.

18. The system of claim 15, 16, or 17, where the Kalman filter is configured to estimate biases of both the first and second inertial sensors, which become separately observable over time as the tracked object changes orientation relative to the moving reference frame.

19. A system for tracking the motion of an object relative to a moving reference frame comprising:

a tracking inertial measurement unit mounted on the tracked object;

three reference inertial measurement units mounted at three separated and non-collinear locations on the moving reference;

an element coupled to said tracking inertial measurement unit and to said reference inertial measurement units and configured to determine an orientation and a position of the object relative to the moving reference frame based on the signals from the inertial measurement units; and

an element coupled to said reference inertial measurement units and configured to determine the angular acceleration of the moving reference frame based on the signals from the inertial measurement units.

20. The system of claim 19 where the determination of angular acceleration of the moving reference frame involves analysis of the differences of linear accelerations measured between each pair of separated reference inertial measurement units.

21. A system for tracking the motion of an object relative to a reference frame, comprising:

an optical sensor for measuring the location of a target in an image plane;

at least three light-emitting targets which emit invisible ultraviolet radiation which can be detected by the optical sensor but which does not interfere with night vision equipment;

an element coupled to said optical sensor and configured to determine a position of the object relative to the reference frame based on the locations of the ultraviolet targets in the image plane of the optical sensor(s).